1. Title: IPM Demonstrations in Peppers

2. Project Leader: Abby Seaman, Area Extension Educator, Vegetable IPM

3. Cooperators: Carol MacNeil and John Gibbons, Yates, Ontario, Wayne, and Steuben Muck Vegetable Program; Brian Boerman, Agricultural Consulting Services, Don Sweet, Crop Advantage, Mike Hoffmann, Dept. of Entomology; Tom Zitter, Dept. of Plant Pathology

4. Type of grant: Monitoring, forecasting, and economic thresholds

5. Project location(s): Ontario, Onondaga, and Orleans counties

6. Abstract:

Vegetable growers can reduce the amount and environmental impact of pesticides used to produce peppers by growing varieties resistant to bacterial leaf spot (BLS) and using thresholds for aphids and European corn borer (ECB). IPM demonstrations comparing the use of thresholds with the grower's usual practices conducted for the past three seasons have documented that crop quality resulting from the use of thresholds is equivalent to that resulting from the grower's usual practices. Growers avoided the use organophosphate insecticides up for review by the FQPA in the IPM area of the demonstration fields. The cost of insect management is higher when organophosphates are not used than when they are used. Currently, there are a limited number of non-organophosphate insecticides labeled for use against ECB control that do not contribute to aphid outbreaks, and no options that control both ECB and aphids.

7. Background and justification:

In a 1996 survey, 38% of New York fresh market vegetable growers reported growing peppers, making it the sixth most frequently grown fresh market crop (Hoffmann et al., 1997). Aphids and European corn borer were by far the most frequently reported pests of pepper, with corn earworm, cutworms, thrips, and Colorado potato beetle also reported by 4-11% of growers. Disease problems most frequently cited were bacterial leaf spot (BLS) and Phytophthora blight. In New York, IPM procedures have not been developed for or demonstrated in peppers, and growers have no specific guidelines for timing insecticide applications. The number of insecticide applications to peppers in New York for ECB and aphid control ranges between three and seven per season (M. Orfanedes, pers. comm., Knodel et al. 1997). Where BLS is present, growers may be applying copper/mancozeb sprays weekly, with no guarantee of success if the weather favors disease development.

In New England, IPM thresholds and procedures developed in Connecticut (CT) have been demonstrated for a number of years. In demonstrations in CT, the number of insecticide applications to peppers can be cut in half when while maintaining crop quality where insect thresholds are used, and copper/mancozeb applications eliminated by the use of BLS resistant varieties (1997 CT IPM Annual Report)

Many of the insecticides currently recommended for use on peppers in NY are carbamates or organophosphates, and are under review by the EPA. Growers need to

know how alternatives to the organophosphates and carbamates work against target pests and how they fit into a comprehensive pest management program.

8. Objectives:

1) Conduct split fields demonstrations of the New England IPM procedures for peppers with three New York pepper growers.

2) Compare ECB pheromone trap catches in traps set up at the edge of pepper fields with catches in traps set up near corn fields on the same farm.

3) Evaluate pepper quality at harvest, number of insecticide and bactericide sprays, environmental impact, and cost of adopting IPM practices compared with the grower's current practice.

9. Procedures:

1) Demonstration fields were established on three different farms, designated K, F, and E. An IPM area was designated in each field. BLS resistant varieties were planted in the IPM area of all three fields. Each area of the fields was scouted weekly, and the scouting records for both areas were given to the grower. In the IPM part of the fields, insects were managed as follows: for aphids a threshold of 8 per leaf; for ECB applications targeted peak ECB flights once fruit were walnut-sized or larger. Growers were asked to apply insecticides only when the field was over threshold for these two pests. Growers were asked to use Spintor in the IPM areas for ECB control at all locations.
2) ECB-E and ECB-Z traps were set up in a grassy area at the edge of each pepper field and also near a corn field on the same farm. We used Scentry Heliothis net traps and Trece Inc. lures. Lures were replaced every two weeks.
3) Growers maintained spray records for both parts of the field. Fifty fruit were harvested from each area of the fields on each of three harvest dates during the period the growers were harvesting for market. Each pepper was cut open to look for ECB infestation.

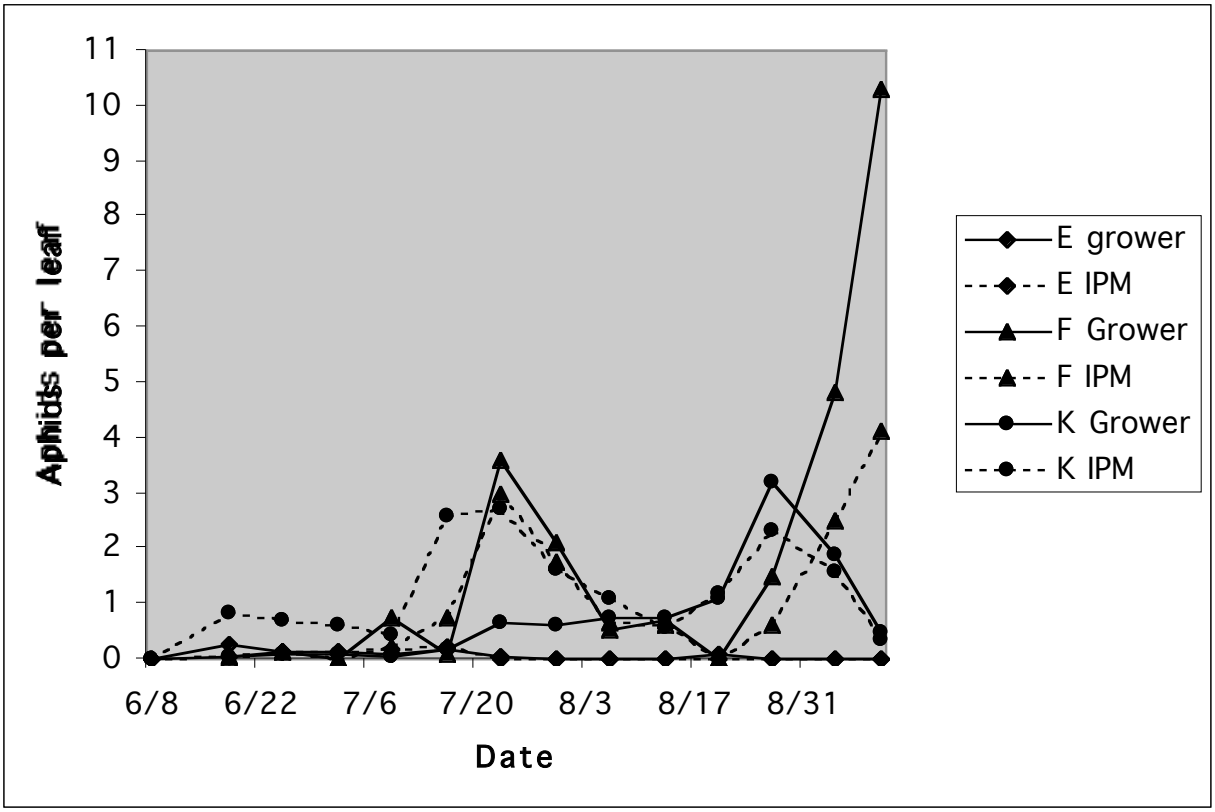
10. Results and discussion

The 2001 growing season was hot and dry. Two of the fields were planted on plastic with trickle and produced very well; the third ("F") was on bare ground without irrigation and struggled all season. All three IPM areas were planted to bacterial leaf spot resistant varieties. As we did in 2000, we saw a few BLS resistant plants with symptoms similar to BLS. The bacteria causing bacterial canker on tomato (*Clavibacter michiganensis* subsp. *michiganensis)* has been isolated by Tom Zitter and the Cornell Diagnostic Laboratory from peppers showing these symptoms. In the three years we've seen these symptoms in peppers, there have been only a few infected plants, and the disease has not spread.

APHIDS

Aphid numbers were low to non-existent at the "E" location and the field did not reach threshold in either the IPM or grower areas. At the F and K locations, aphid numbers increased in both areas of the field in late July and again in late August, but the growers decided not to apply aphid-targeted insecticides to the IPM areas (Figure 1). At the K location the populations decreased, but at the F location the populations were still increasing when we stopped scouting in mid-September. The grower didn't want to invest any more money in the crop, which was severely affected by the drought.

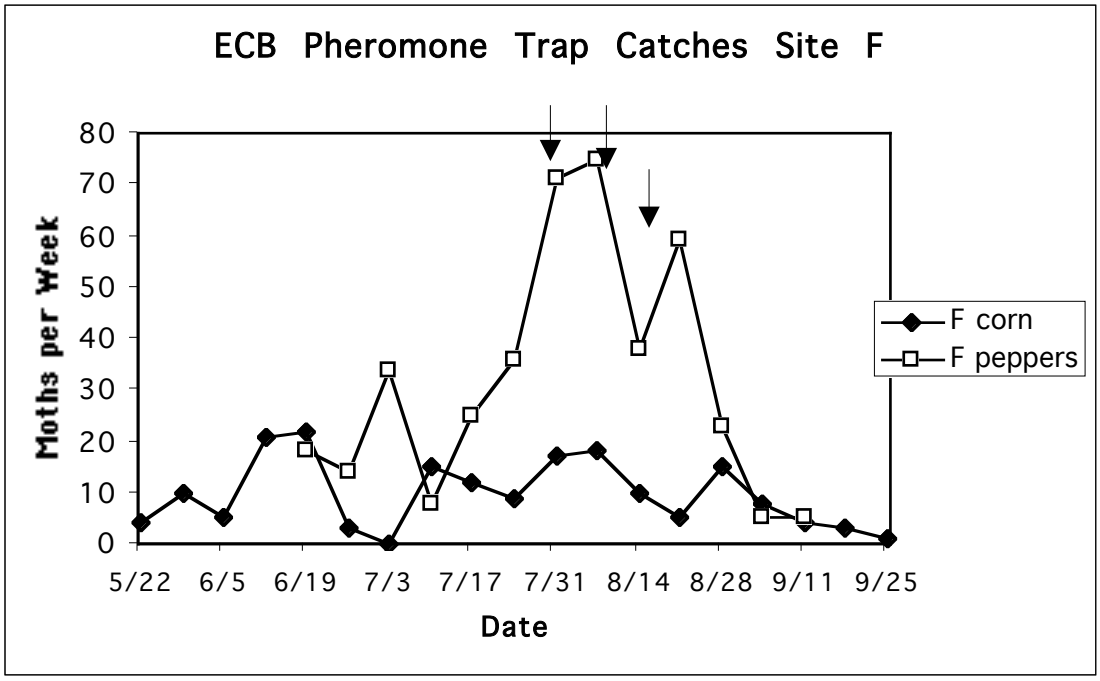
Figure 1.



PHEROMONE TRAP CATCHES AND ECB

Because the Connecticut threshold for ECB is an absolute number of moths caught per week, the question of whether traps set up near sweet corn for the sweet corn pheromone trap network are sufficient for making decisions in peppers arises. This season, as in the past two seasons, we did not see a consistently higher or lower trap catches in traps placed near corn compared with those near pepper fields (Fig. 2), although the general flight trends were similar in traps placed near the two crops. This season we did not use the numerical threshold of seven moths per week to time ECB applications, but instead made decisions based on fruit size and whether trap catches were increasing toward a peak flight. This approach appears to have worked well in 2001. In Figure 2, the arrows indicate when insecticides were applied for ECB in the IPM areas.

Figure 2.


ECB Pheromone Trap Catches Site F
Moths per Week
80
70
60
50
40
30
20
10
0
5/22
6/5
6/19
7/3
7/17
7/31
8/14
8/28
9/11
9/25
Date
F corn
F peppers

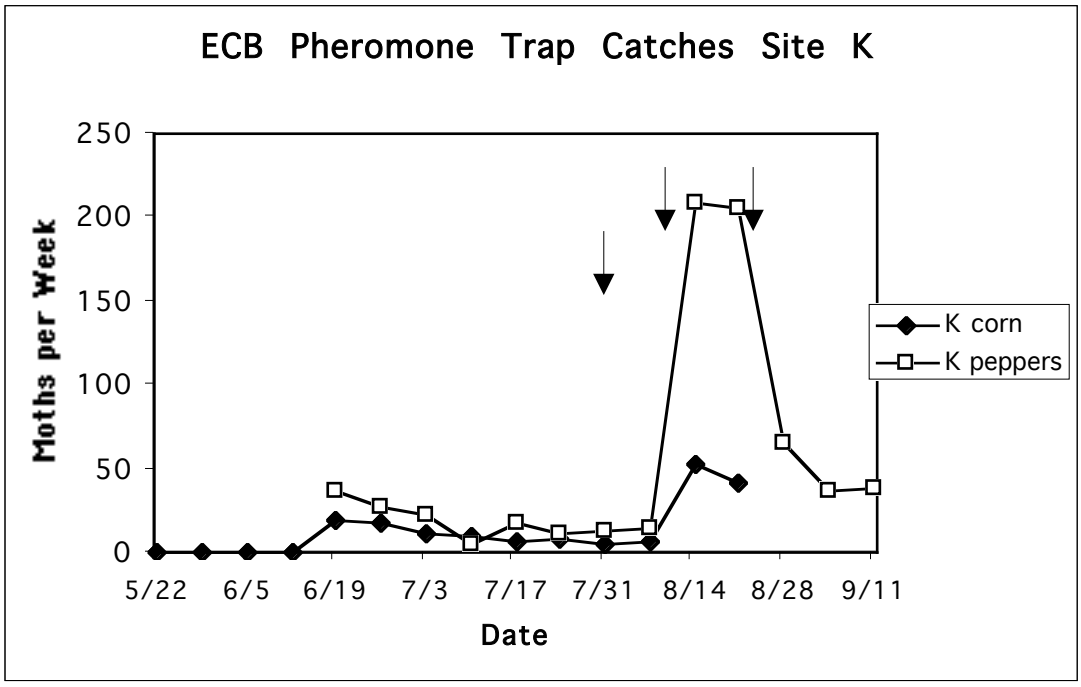
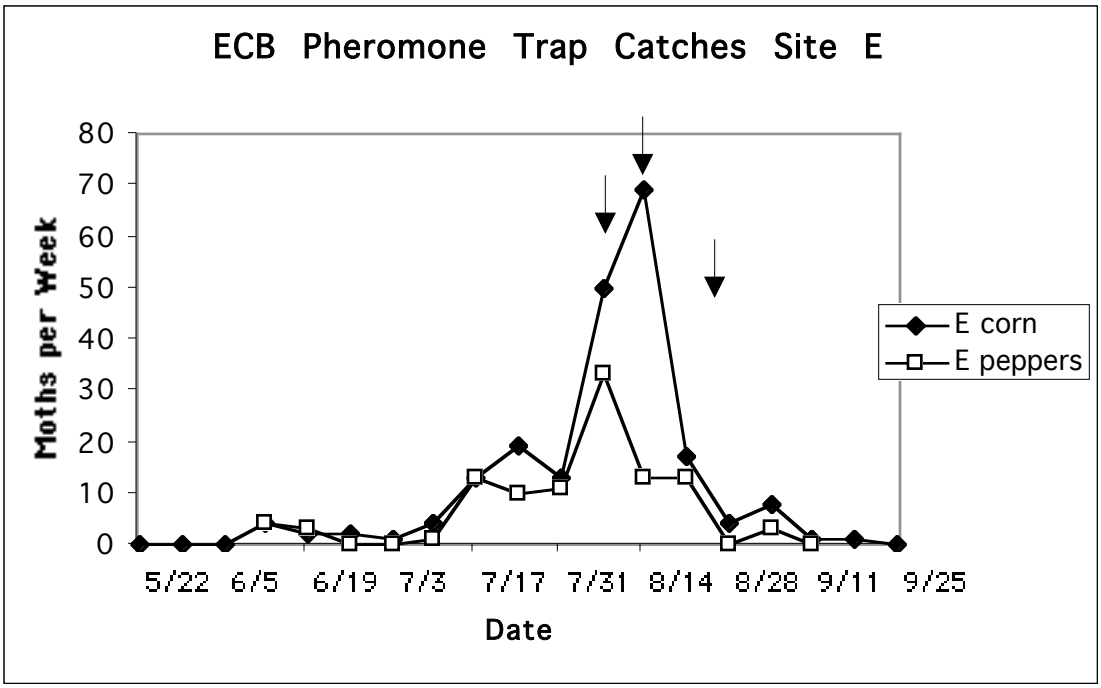

ECB Pheromone Trap Catches Site K
Moths per Week
250
200
150
100
50
0
5/22
6/5
6/19
7/3
7/17
7/31
8/14
8/28
9/11
Date
K corn
K peppers

Figure 2 (cont.)



PESTICIDE USE, COST, AND EIQ

Table 1 shows spray records for the three fields. As we saw in the past two seasons, copper applications increase the seasonal EIQ substantially. Copper was applied at location F despite the use of BLS resistant varieties. At the E and K locations the use of Spintor and decreased use of copper resulted in substantially lower EIQ's for the IPM areas of the fields. However, pest management costs were higher in the IPM area in two if the three fields. Three insecticide applications bracketing peak ECB flights were sufficient for ECB control this season.

Table 1

Site E	IPM				Grower			
Date	Material	Rate/A	Cost/A	Field use EIQ	Material	Rate/A	Cost/A	Field use EIQ
22-Jul					Orthene 75 S	1 lb.	$12.60	13.4
					Champ	1.3 pt.	$16.38	16.2
1-Aug	Spintor	4 oz	$17.80	1.1				
13-Aug	Spintor	4 oz	$17.80	1.1	Orthene 75 S	1 lb.	$12.60	13.4
					Champ	1.3 pt.	$16.38	16.2
22-Aug	Spintor	4 oz.	$17.80	1.1	Orthene 75 S	1 lb.	$12.60	13.4
					Champ	1.3 pt.	$16.38	16.2
		Totals	$53.40	3.3		Totals	$86.94	88.8

Site F	IPM				Grower			
Date	Material	Rate/A	Cost/A	Field use EIQ	Material	Rate/A	Cost/A	Field use EIQ
29-Jun					Mankocide	3 lb.		74.1
					Bravo	1 qt.	$13.76	49.68
2-Aug	Spintor	4 oz.	$17.80	1.1	Spintor	4 oz.	$17.80	1.1
	Bravo	1 qt.	$13.76	49.68	Bravo	1 qt.	$13.76	49.68
9-Aug	Spintor	4 oz.	$17.80	1.1	Spintor	4 oz.	$17.80	1.1
	Bravo	1 qt.	$13.76	49.68	Bravo	1 qt.	$13.76	49.68
15-Aug	Spintor	4 oz.	$17.80	1.1	Spintor	4 oz.	$17.80	1.1
	Mankocide	3 lb.	$11.13	74.1	Mankocide	3 lb.	$11.13	74.1
		Totals	$92.05	176.76		Totals	$105.81	300.54

Site K	IPM				Grower			
Date	Material	Rate/A	Cost/A	Field use EIQ	Material	Rate/A	Cost/A	Field use EIQ
10-Jun					Orthene	1 lb.	$12.60	13.4
25-Jun					Kocide	2 lb.	$4.90	40.9
27-Jul	Spintor	5 oz	$22.25	1.4	Spintor	5 oz	$22.25	1.4
10-Aug	Spintor	5 oz	$22.25	1.4	Spintor	5 oz	$22.25	1.4
21-Aug	Spintor	5 oz	$22.25	1.4	Spintor	5 oz	$22.25	1.4
		Totals	$66.75	4.2		Totals	$84.25	58.5

CROP QUALITY

The average levels of fruit infestation found in each area of the demonstration fields can be found in Table 2. Crop quality was not significantly different in the IPM area than in the rest of the field, and all the cooperating growers were satisfied with the crop quality (in terms of pest infestation) in both parts of the fields.

Table 2

Location	Treatment	% ECB infestation	% infestation other leps.	Total % infestation
E	IPM	6.9	0	6.9
	Grower	6.3	0	6.3
F	IPM	2.4	0	2.4
	Grower	0.6	0.6	1.2
K	IPM	1.2	0.6	1.8
	Grower	4.1	0.6	4.6

Three seasons of demonstrations of the Connecticut pepper IPM procedures have shown that they work well under New York conditions and have the potential to

reduce cost (when BLS resistant varieties are used) and environmental impact. Effective pest management is possible without the use of organophosphates and carbamates, but the cost is higher and the lack of insecticides alternatives for ECB management will be a potential problem if Orthene is taken off the market. Pyrethroids have the potential to increase aphid problems (Dan Gilrein, personal communication), and the Spintor/Provado combination that would substitute for Orthene in efficacy is much more expensive. New materials with efficacy against both ECB and aphids while also conserving beneficials would be very useful.